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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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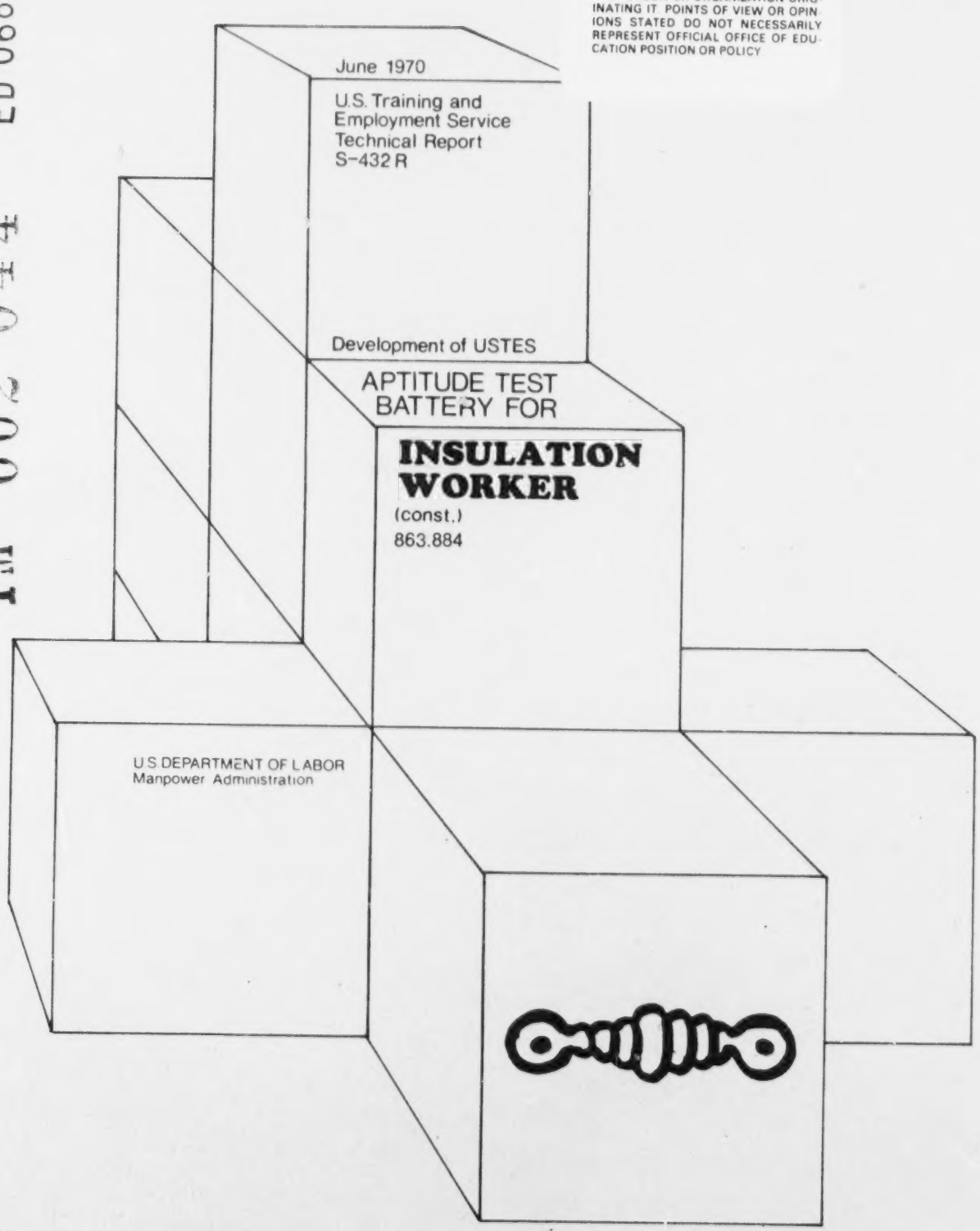

ED 068563

Technical Report on Development of USTES Aptitude Test Battery

For . . . . . .

Insulation Worker (const.) 863.884

S-432 R

(Developed in Cooperation with the
Missouri State Employment Service)

U.S. Department of Labor
Manpower Administration

June 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the predication of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study #2736

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

FOR

Insulation Worker (const.) 863.884-026

S-432 R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Insulation Worker (const.) 863.884-026. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
N - Numerical Aptitude	75
M - Manual Dexterity	85

RESEARCH SUMMARY - VALIDATION SAMPLE

Sample: 50 male Insulation Workers employed by various companies in Kansas City, Missouri. All were classified as non-minority group members.

Criterion: Supervisory ratings.

Design: Concurrent (test and criterion data were collected at approximately the same time.

Minimum aptitude requirements were determined on the basis of a job analysis, and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity: Phi coefficient = .33 ($P/2 < .025$)

Effectiveness of Norms: Only 68% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 83% would have been good workers. 32% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 17% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	68%	83%
Poor Workers	32%	17%

VALIDATION SAMPLE DESCRIPTION

Size:

N = 50

Occupational Status:

Employed Workers

Work Setting:

Workers were employed by various construction companies and insulation contractors in Kansas City, Missouri.

Selection Requirements:

Age: 18-31 years old
Education: None prior to 1965. High school diploma subsequent to 1965.
Previous Experience: None required.
Tests: None used.

Principal Activities:

The job duties for each worker are those shown in the job description in the Appendix.

Minimum Experience:

All workers had completed at least thirty-six months total job experience before they were tested.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations With the Criterion (r) for Age, Education and Experience

	Mean	SD	Range	r
Age (years)	39.1	10.8	21-64	.104
Education (years)	11.2	1.8	7-15	-.036
Experience (months)	196.6	96.8	36-384	.119

EXPERIMENTAL TEST BATTERY

All twelve tests of the GATB, B-1002 were administered to the validation sample during the month of July, 1968.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as test data were collected, with a time interval of a least two weeks between the first and second ratings of those workers (38) for which two ratings were obtained.

Rating Scale: USES Form SP-21, Descriptive Rating Scale (see Appendix). The scale contained seven items covering different aspects of job performance with five alternatives for each item.

Reliability: A reliability coefficient of .99 was obtained between the two ratings of 38 workers. Therefore, the final criterion consists of the combined scores of the two ratings for 38 workers and the doubling of the one rating of the other 12 workers to correspond to the two ratings of the first group.

Criterion Score Distribution:

Possible Range:	14-70
Actual Range:	24-66
Mean:	51.3
Standard Deviation:	8.9

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 32% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 48.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout on the basis of a qualitative analysis of job duties involved and statistical analyses of test and criterion data. Aptitude S, which does not have a significant correlation with the criterion,

was considered for inclusion in the norms because qualitative analysis indicated that this aptitude was important for the job duties and the sample had a relatively high mean score for S. A relatively high mean score may indicate that sample preselection has taken place. Aptitude N was considered for inclusion in the trial norms because Aptitude G which qualified for consideration was eliminated from consideration in this reanalyses in order to minimize the verbal requirements of the battery. (In the composition of Aptitude G, arithmetic reasoning has the highest factor loading.) Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis

(Based on the job analysis, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
G - General Learning Ability	Necessary in order to be able to retain subject matter essential for the job and for exercising independent judgments while on the job.
N - Numerical Aptitude	Necessary for making accurate measurements and computations
S - Spatial Aptitude	Necessary for the proper cutting and shaping of materials
P - Form Perception	Necessary for making measurements and for fitting and finishing work
M - Manual Dexterity	Necessary for handling of tools and materials

On the basis of the job analysis data, aptitude V is considered obviously unimportant for performing the job duties and is considered an irrelevant aptitude.

TABLE 4

Means, Standard Deivations (SD), Ranges and Pearson Product-Moment Correlations With the Criterion (r) for the Aptitudes of the GATB

Aptitude	Mean	SD	Range	r
G - General Learning Ability	99.3	16.4	58-131	.126
V - Verbal Aptitude	94.6	15.4	63-135	-.040
N - Numerical Aptitude	96.8	20.6	41-138	.204
S - Spatial Aptitude	105.0	17.9	65-140	-.084
P - Form Perception	99.4	17.5	55-146	.018
Q - Clerical Perception	106.2	15.6	72-143	.006
K - Motor Coordination	102.3	25.2	39-180	.238
F - Finger Dexterity	82.0	18.3	11-117	.269
M - Manual Dexterity	92.0	18.7	52-134	.291*

*Significant at the .05 level.

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X		X	X	X				X
Irrelevant		Q							
Relatively High Mean				X		X	X		
Relatively Low Standard Dev.	X	X				X			
Significant Correlation With Criterion									X
Aptitudes to be Considered for Trial Norms			N	S					M

Derivation and Validity of Norms

Final norms were derived on the bais of a comparision of the degree to which trial norms consisting of various combinations of Aptitudes N, S and M at trial cutting scores were able to differentiate between the 68% of the sample considered good workers and the 32% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three aptitude norms. For two aptitude norms, minimum cutting scores of slightly higher than one standard deviation below the mean

will eliminate about one-third of the sample; for four aptitude trial norms, cutting scores of slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The phi coefficient was used as a basis for comparing trial norms. Norms of N-75 and M-85 provided the optimum differentiation for the occupation of Insulation Worker (const.) 863.884-026. The validity of these norms is shown in Table 6 and is indicated by a phi coefficient of .33 (statistically significant at the .025 level).

TABLE 6

Concurrent Validity of Test Norms
N-75 and M-85

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	24	34
Poor Workers	11	5	16
Total	21	29	50

Phi coefficient (ϕ) = .33 Chi square (X^2_y) = 5.4
Significance level = $P/2 < .025$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-37 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .13 is obtained with the OAP-37 norms of N-80, S-95 and M-85.

SP-21

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____

D. O. T. Title and Code

Directions: Please read the suggestions to raters on the back of this form and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print) _____

(Last) (First)

Sex: Male____ Female____

Company Job Title: _____

How often do you see this worker in a work situation?

- ☐ See him at work all the time.
- ☐ See him at work several times a day.
- ☐ See him at work several times a week.
- ☐ Seldom see him in work situation.

How long have you worked with him?

- ☐ Under one month.
- ☐ One to two months.
- ☐ Three to five months
- ☐ Six months or more

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

- ☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.
- ☐ 2. Capable of low work output. Can perform at a slow pace.
- ☐ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.
- ☐ 4. Capable of high work output. Can perform at a fast pace.
- ☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.

☐ 3. Performance is acceptable but usually not superior in quality.

☐ 4. Performance is usually superior in quality.

☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

☐ 3. Makes mistakes occasionally. Work needs only normal checking.

☐ 4. Makes few mistakes. Work seldom needs checking.

☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

FACT SHEET

Job Title: Insulation Worker (const.) 863.884-026

Job Summary:

Covers exposed surfaces of equipment such as boilers and pipes by hand with insulating material to protect equipment from heat or cold.

Work Performed:

Applies insulating material to exposed surfaces of equipment, such as boilers, tanks, hot- or cold-air ducts or pipes, and steam generators: Selects type of insulating material, such as asbestos mastic, felt, fiber glass, or mineral wool, on basis of heat-retaining or heat-excluding characteristics. Binds wire netting around object being insulated to hold insulating material in place or form reinforced base for plastic insulating materials. Applies one or more coats of insulating material over wire netting, smoothing final coat with trowel. When covering pipes, cuts block or preformed pipe insulation to required size and shape, using saw, knife or rasp. Clips metal bands to pipe insulation to secure insulation on pipes and fits sections of pipe insulation to pipe surface. When covering flat surfaces, spot welds or screws wire studs to surface and fastens insulating material to studs. Brushes water proofing cement over surface and presses insulating material into place. Coats joints with cement and wraps them with tape to seal them. May cover pipe with felt bound with wire or gauze covered with plaster of paris.

May also do some of the duties of Insulation-Blanket Maker (pipe & boiler covering) 863.781

Effectiveness of Norms:

Only 68% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-432 R norms, 83% would have been good workers. 32% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-432 R norms, only 17% would have been poor workers.

Applicability of S-432 R Norms:

The aptitude test battery is applicable to jobs which include a majority of the duties described above.

GPO 898.725

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